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★ THIS MONTH ★

WELLINGTON BRINK
Editor

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NEW DIRECTORY.—The National Wildlife Federation, 232 Carroll Street, N.W., Washington 12, D.C., has released its new directory of organizations and officials concerned with the protection of wildlife and other natural resources. Price is 25 cents. This 52-page directory is extremely helpful to those who want the names and addresses of officials of various state, federal and private conservation organizations.

KANSAS LAKES.—Ten new Kansas lakes are either now completed or will be soon. The addition of these lakes increases the number of state lakes under Kansas state government supervision from 22 to 32. The lakes enlarge the total state park area by 2,220 acres and add more than 690 acres of fishing waters.

ADULT EDUCATION FUND.—The amount of $7,500 will be provided each year by the Montana Fish and Game Commission for conservation education in Montana State University and Montana State College, according to a recent announcement. Emphasis will be on adult education.

FRONT COVER.—Ptarmigan in the Gunnison National Forest, Colorado. Wildlife always has an important part in the land ecology.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

If It Rains

By GEORGE W. MUSGRAVE

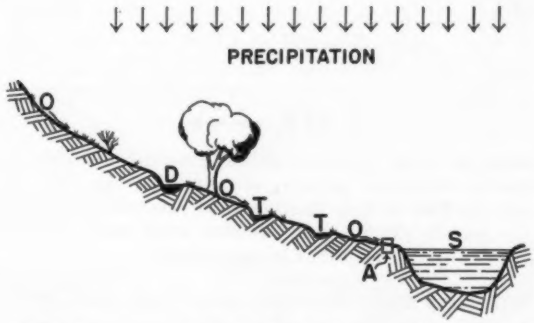
IN SOME places where people have not seen rain for many months, "if it rains" may raise questions as to what may happen. Most of us think we know what happens when it rains. But do we, actually?

We know that rain wets the ground and the vegetation. We know that some rain goes into the ground. The amount may be enough to grow a crop. At other times, most of the rain runs off. At intervals there may be enough penetration to replenish springs and wells that are nearly dry. At other times the same amount of rainfall fails to produce these effects. On some soils farmers are known to plow within an hour after a heavy rain and have no bad results—a very common occurrence in parts of Cuba and other places in the Tropics.

If you ask how much of a given rain will go into a certain soil, you have a good chance to stump the experts. Or you may ask how much will stay in the root zone for as long as a full day. When you advance such a query, you are asking "the $64 question." No one can give a precise answer with any assurance. Usually the answer must be based on other "ifs"—*if* it rains as much as 4 inches; *if* it is a slow rain; *if* the ground was already moist, for example.

Much of the science of farming, of the conservation of soil and of water, depends upon at least approximately correct answers to questions like these. In the last 25 years there has been a tremendous advance in our ability to find the answers.

To show how great has been the change in thinking, let me confess some of my own ignorance as of 1929 or thereabouts. I was measuring rainfall and runoff. The question arose: What happened to the water that did *not* run off? Discussion with many state and federal workers did not provide an answer. Therefore, a small experiment was set up to try to see what could be found out. If we applied manure to some of the test areas, how would it affect the amount of rainfall entering the soil; the amount of water held by the soil; the amount and rate of movement of water through the soil? Many of the people with whom we talked (including co-workers, farmers, a county agent) thought manure would slow down intake of rain and movement through soil. This wrong idea, of course, came from our lack of information. Today we know that the opposite is true but our first published report dealt with cultivation and its effect on intake.

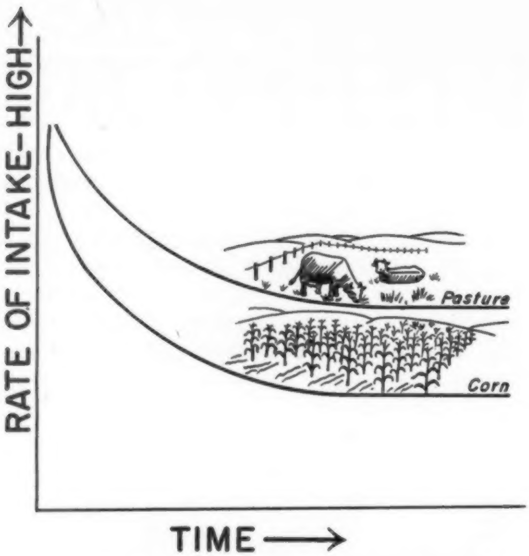


The rain comes. It wets the landscape, starts flow in diversion ditches (D), fills terrace channels (T), produces flow (O), and adds to streamflow (S). What happens within the block of surface soil (A) is described in this article.

In those early days of studying what happens to rainfall, other people, too, had mistaken ideas. A very famous engineer considered that the amount of water entering the soil in the first 15 minutes was the same in amount as that entering it during any other 15-minute period. Though we now know that the rate of intake at the beginning is higher than that of later periods, such information was not available 25 years ago.

The amount of rainfall on a forest or cornfield is greater than that reaching the ground beneath such a canopy. A snowstorm on a pine forest makes a fairyland of beauty because part of the snow never gets to the ground. Rain, also, may be held on vegetation, the amount depending upon the density of the vegetation and the kind of storm. This amount may vary from 0.01 inch to 0.30 inch or more.

Note.—The author is staff specialist (infiltration), engineering division, Soil Conservation Service, Washington, D. C.



Rates of intake of water by soil growing corn and by land in bluegrass pasture, showing that the rate on both declines as time (i.e., hours of rain) increases but the rate in the cornfield declines much more rapidly than that in the pasture.

But far greater in importance than the difference in amount reaching the ground is the protection the vegetation provides the soil against the pounding of the drops. A sharp shower on bare ground really tears the soil apart but the same rain on a good meadow may do little damage. This we all have observed many times.

One of the worst things that happens to the bare ground is that its surface is sealed over by muddy water, and later rains do not readily enter the soil. But this does not happen in the good meadow nor the good forest. Nor does it happen when the wheatgrower has applied a straw mulch to his field, nor when subsurface tillage is practiced so that the remains of a preceding crop are left on the surface. Let's take an actual case. Measurements of the capacity of a soil typical of the Corn Belt have been made and the hourly changes in moisture movement when it rains carefully noted.

The measured rates of intake of water by soil growing corn and by land in bluegrass pasture are shown in the accompanying chart. The two fields start with a rate above 1 inch per hour, indicating that rain of 1 inch per hour would be entirely absorbed for a few minutes under either condition. After an hour, the intake rate on the corn has dropped to about half an inch per hour, but the pasture has dropped only to 0.8 inch per hour. After 5 hours the corn ground has dropped to 0.18 inch per hour but the pasture, at 0.29 inch per hour, is 60 percent above it! During the 5 hours the corn ground has had a total intake of 2.17 inches and the pasture 2.77 inches. This difference of 0.6 inch is not unusual and actually is often exceeded on deep soils. It is about the same as though the pasture received 0.6 inch more rain in one storm—something which, in a dry year, can make a person feel good!

There are, of course, other things that can also encourage the intake of water. On tight soils or soils with naturally low intake rates, improvement can result from such things as building up the organic matter content. This has the effect of forming larger pores in the soil. There are numbers of other ways, too, of retarding flow and giving more time for infiltration, such as contouring, using level terraces, and using close vegetation like grass and alfalfa, in contrast to row crops.

We know much more about rainfall and water *on* the land surface than we do about the movement of water *beneath* the surface. Especially, are we weak in information as to *how much* water moves up, down, or sideways within the soil, at what seasons of the year, and under what different conditions. The greatly oversimplified sketches below may help in showing how movement of water in some one direction also affects movement in another—a matter of real importance to anyone concerned with management or use of water.

The accompanying sketch shows what happens on the ground surface—something we all see and know. But what happens within a block of soil near the surface, like the block labeled "A" in the sketch?

Suppose it rains an inch per hour at a time when the soil is moist. The intake of water and its movement through the soil is often like the case portrayed by the series of sketches that show what has happened at the end of 1 hour of rain; 3 hours; 6 hours; 8 hours.

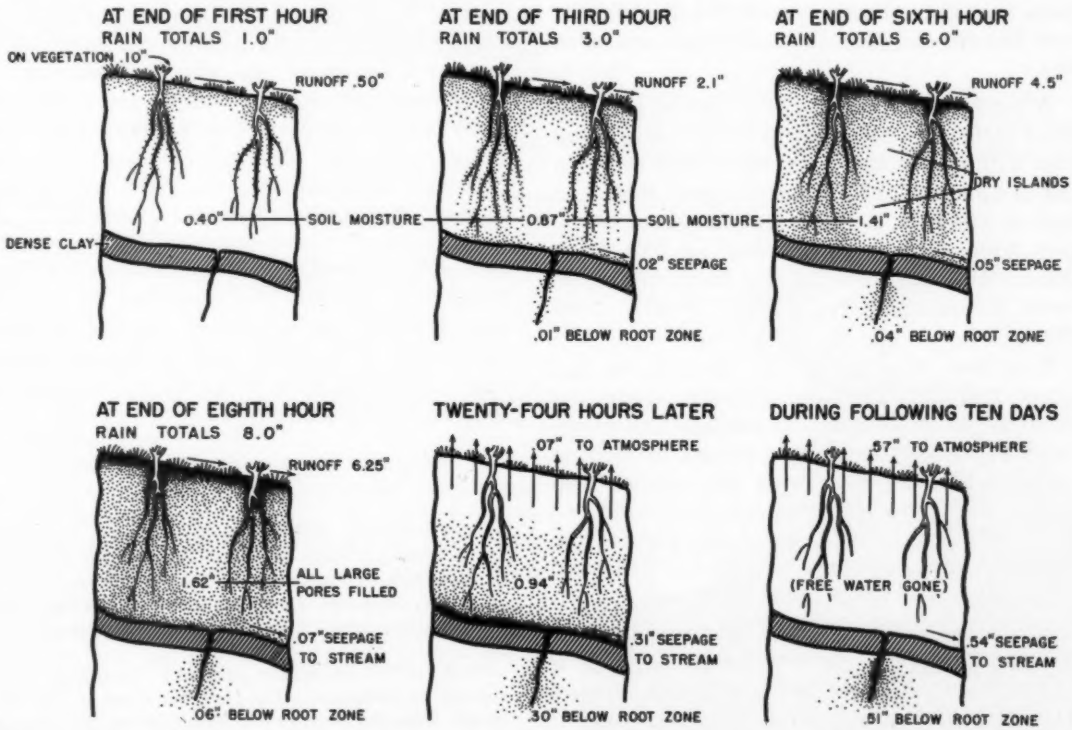
This being a sandy loam with average vegetation on it, a few old root channels in it, and a normal or very common intake rate, we see at the end of 1 hour of rain that 0.10 inch of it is on the vegetation; 0.5 inch has run off the surface; and 0.4 inch has entered the soil, the newly added water being mostly near the surface and along the old root channels.

At the end of the third hour of rain, runoff has totaled 2.1 inch of the 3 inches of rainfall, and a total of 0.87 inch of water has been added to the soil. A little of the 0.90 inch that entered the soil has seeped out toward the stream, moving along a clay layer just below the plant roots. A little has broken through the clay layer and started moving down toward ground water.

After 6 hours of rain, the larger pores of the soil have nearly all filled, although there are still a couple of dry "islands" not yet wetted. Seepage has continued and there has been, also, some further movement to depths below root zone.

During the seventh hour (not shown in the sketch) all but 0.03 inch of the large pore capacity of the soil is filled, so that in the last hour the intake is limited to this 0.03 inch, causing runoff totaling 6.25 inches when the rain stops. Seepage to the stream at this time totals 0.07 inch, and movement below root zone 0.06 inch. Had the impeding clay layer been located deeper, more of the surface water would enter and runoff would be less.

During this assumed storm, occurring under known soil conditions, the intake rate is 0.40 inch per hour at first. Then it drops to 0.30 inch in the third hour, and 0.22 inch in the eighth hour. Thus, the rate is nearly constant at the end of this storm on moist soil, being governed largely by characteristics of the soil.



The intake of water by the soil (marked A in sketch) is only part of the story of what happens when it rains. During the first hour only the upper portion and that along old root channels are saturated. Gradually, with more rain and more intake, the soil becomes nearly saturated and seepage from Block A starts toward streams and deepseated ground water. Note that there still remain some dry islands after 8 hours of rain. After rain ceases, the soil begins to dry out from the top, and in about 10 days loses the water it had gained in this storm.

Rates of intake obtained in this manner for row crops or fallow conditions—that is, minimum rates when the soil has been presaturated and for storms where rainfall is above the intake rate—are most useful in giving to the designing engineer basic figures for estimating runoff from watersheds. Where the land condition is improved, the minimum rates may be adjusted upwards on the basis of experimental data on land condition. They should not be confused with water application rates in irrigation guides, since these are for soils at least partly dry and intended for the irrigator who is applying a certain amount of water to the soil. Typical rate-of-in-intake curves for this soil with good vegetation (bluegrass pasture), in contrast to row crops, show that the rate drops very slowly under grass but much more rapidly for the row crop. On very open soils (with no impeding layer near the surface) the differences are usually greater than shown by these curves. On the tighter soils like the claypans the differences are much less.

After the rain, and as soon as the sun and wind strike the soil, moisture begins to move out. Within 24 hours the newly added water in our sample block of soil has dropped from 1.62 inch to 0.94 inch. Seepage and movement below root zone account for a total of 0.61 inch. About 0.07 has gone in the form of vapor, some through plants and some directly from the soil.

Ten days later all of the free water has gone—0.57 inch as vapor through plants and from soil, and 1.05 inch as seepage and movement below root zone. This brings us back to where we started: a moist soil but no free water. Another 10 days of sun and wind can be counted on to remove a large part of the capillary moisture and the plants will then begin to signal their need for a new supply.

Much has been published showing how intake of water by soils may be increased, how the surface of a permeable soil can be protected so it is not injured by the impact of beating rains, how organic matter in the soil improves movement of water through it, and how the formation of a plowsole or other dense layer can be prevented. These principles are rapidly being applied in everyday farming operation.

Some things about the occurrence of water on or in the soil cannot be changed very much. Even with excellent cover, a high percent of runoff from tight soils is common. The amount of rain and its intensities at different seasons of the year and when vegetation may or may not be luxuriant is an item man cannot control or modify to any appreciable degree. His approach must be that of proper management of the water, the soil, and the vegetation. Experience shows definitely that great improvement is possible.

For wise management of water, soils, and vegetation, all of the many important things that affect their complex relationship must be considered. It is necessary to interpret how one phase of the water cycle affects another: for example, how increased intake of rain affects the total runoff in a stream, or how it is affected by a change in vegetation or by soil characteristics. In the past 25 years we have learned a lot about the wise management of water, soil, and vegetation. We know what will cause an increase in this or that phase of water movement. Mostly our deficiencies in information pertain to *how great* will be the change. It may be that exact prediction of the amount of water discharged by a certain stream in flood flow will be difficult for some years yet, but absolute precision is not required before improvements can be brought about. We are making vast strides in knowledge, and confirming it by the experience accrued over the years.

GIRLS PROFIT, TOO.—The Pennsylvania federation of sportsmen's clubs has been sponsoring a Junior Conservation Camp for 6 years, under the supervision of C. .W. Stoddart, Jr. Last summer 155 boys took the 2-weeks course. This time there was also a course for girls.

How did this innovation pan out? According to the reports of instructors, the girls did some of the work better than the boys. For example, in the compass hikes which were a part of the survival program, no girls got lost. In the four boy's camps, at least one group lost its way each time.

A number of states now have junior conservation camps.

Changing the Face of a Ranch

Grass replaces brush and pickleweed on these California acres. Robert Blohm uses rotation grazing, and production climbs.

This land around the Christ Simon farm was white with alkali before the Emblem bench drainage system was built. It is now under a good cover of grass.

By AL BODE

ONE THOUSAND acres of brush and no water, one hundred acres of pickleweed and too much water: this pretty well describes the Robert Blohm farm as it was 10 years ago. Hardly an acre of the hill land was not covered by dense brush, scrub oak, greasewood, manzanita and poison oak.

Today, tall fescue, perennial ryegrass, and subterranean clover with many annual grasses, replace the brush on about 500 acres of the steep slopes. Where there was chaparral, 75 head of fat Hereford cattle now graze on lush grasses and there is room for still more.

Pickleweed of the salt water marsh has yielded to tall fescue, ryegrass, and birdsfoot trefoil.

This is not a spectacular overnight development, but a well planned, long range program. Brush is cleared and grass seeded at a minimum of cash outlay and a little help from technicians.

Blohm is president of the board of directors of the Elkhorn Soil Conservation District in Monterey County, Calif. He is well aware of the hazards of clearing steep, sandy soil. Simply clearing the land and seeding grass is not quite enough. The brush and bracken ferns reappear if the land is not properly handled immediately afterward. It must be disked the first summer. Herein lies danger. Soil left clean-tilled is open to erosion in the fall.

To overcome the threat of erosion, Blohm is careful to disk across the slope. He leaves on the surface a mulch of leaves, small branches

Blohm surveys results.

Note.—The author is soil conservation aid, Soil Conservation Service, Watsonville, Calif.

Realignment of the Elkhorn Road with earth fill across the Elkhorn Slough made possible the drainage of several hundred acres of salt-contaminated land.

and chopped up ferns. No large area is cleared at one time. There is always a buffer strip left for protection. Using these practices, erosion has been almost nil. Clearing is done with a tractor equipped with bulldozer. Oak trees too large to be taken out readily with this light rig are left for shade. Blohm says the land where manzanita grows is very poor and grass does not do well, so no manzanita land is cleared for the purpose of range seeding. He has sold, however, many cords of manzanita root for the manufacture of smoking pipes.

For stock water, 10 small dams were thrown up with the bulldozer at small cost. These were built in canyons, and filled by winter runoff and summer seepage.

Ever resourceful, Blohm in one instance even took advantage of a county road fill: During construction of the road, which forms the southern boundary of his farm, he prevailed upon the county to place a culvert high enough up in the fill to act as a spillway! With a little extra earth placed against the road fill, an inexpensive stock water reservoir was the result. By proper fencing, this was made to serve two fields. Another pond was fenced off to provide water for stock from three fields.

Each canyon was fenced so that the ranch would be divided into 13 separate fields. Blohm is a firm believer in rotation grazing and says he has strung 50 miles of barbed wire to accomplish this end.

Much of the romance of cowpunching has been taken out of Blohm's ranch operations. Instead of donning chaps, spurs and ten-gallon hat, and mounting a mustang to chase his cattle into a new field, he merely drives up to the gate in his red pickup, honks the horn and waits for the cattle to come to him. They always do. They have learned that that horn means new lush grass.

No part of the range is overgrazed. Blohm says, "I would rather have too few cattle and too much grass than too little grass and too many cows." In fact, the range is considerably undergrazed; hence, ripgut is coming in. But Blohm is not greatly disturbed. The ripgut is not in abundance and it will be controlled by early season grazing when the range is fully stocked. He says that ripgut is good feed when young, and later in the season when

Robert Blohm drives while Lew Hands, soil conservationist, tends the seeder. Five hundred acres of this land, formerly in brush, has been seeded. Trashy tillage protects from erosion.

wet. His cattle spend the night and early morning on the hill range where they graze on seeded perennials and the ripgut, if the latter is wet from fog or dew. They seek the slough range during the day, where they get their daily quota of salt. No salt bricks are needed. The Pacific Ocean, via Monterey Bay and Elkhorn Slough, provides the salt naturally.

Now about that hundred acres of salty sloughland. Blohm's 100 acres are only a small part of the Elkhorn Slough. Actually, the slough covers several thousand acres extending from Monterey Bay, at Moss Landing, to several miles up the Carneros Creek drainageway. It is formed by tidewater from the ocean.

When the county realigned the Elkhorn Road it did away with the old Elkhorn Bridge and made an earth fill across the slough. The Moss Landing Harbor Board, a wide-awake group, saw an opportunity to help their own facilities; therefore, it furnished tide gates to be placed in culverts through the road fill. This made possible the drainage of Blohm's 100 acres, as well as several other pieces of neighboring sloughland.

The tide gates permit the fresh water of Carneros Creek, and floodwater from winter rains, to pass on out to the ocean some 4 miles away. They also prevent the sea water from flooding the land at high tide. Blohm was quick to take advantage of his opportunity. He got help from Soil Conservation Service technicians. The technicians found over 3 percent salt in areas where pickleweed was abundant, and only 0.24 percent salt on the hummocks within the slough area where some annual ryegrass was growing. Besides drainage, there remained the problem of leaching out the salt. Blohm chose the simplest and cheapest way, although not necessarily the quickest and surest. He simply plowed the land deeply, turning it over in great ribbons of pickleweed sod, and then waited for flooding by winter rains and Carneros Creek to do the leaching. Deep dead furrows were left for drainage ditches.

But Blohm got no breaks from the elements. The last two winters have been mild, so no flooding has taken place. Even so, there has been some leaching as areas of pickleweed that were worked a little and seeded are producing well.

In the slough, Blohm seeded birdsfoot trefoil, 3 pounds per acre; ryegrass, 4 pounds per acre; alta fescue, 4 pounds per acre; and strawberry clover, 2 pounds per acre. There is little evidence of the strawberry clover, but the other varieties look fine.

The hill range was seeded to subterranean clover, 4 pounds per acre; rose clover, 4 pounds per acre; ryegrass, 4 pounds per acre; and tall fescue, 4 pounds per acre. Subterranean clover is spreading to areas not seeded and is otherwise showing great promise. In the past, a number of different varieties of grasses and legumes have been tried, but the mix recommended by SCS conservationists, now used, has proved the best.

After selling off some 400 acres of brushland, Blohm has 700 acres upon which, at present, he runs 75 head of grown stock. He figures on ending up with an even 100 head. This is 7 acres per head, in contrast to the average hill range in this area requiring 15 to 20 acres per head.

CONSERVATION BY HOSPITAL.—The value of soil conservation is well demonstrated on the Danvers (Mass.) State Hospital farm. Practically all of the 560 acres have been "tied down" through the establishment and regular maintenance of soil conserving practices. Due to the heavy demand for crop production and the wide variation of soil types, 29 of the 34 conservation practices recommended by the Essex Soil Conservation District for use in the county have been used. These practices make it possible to meet the heavy yearly demand for production of 65 acres of row crops, hay for a herd of 125 registered Holstein cattle, and pasturage for young stock and some 500 hogs. About 40 acres of the farm are in permanent woodland. The fact that conservation has paid on this farm is evident throughout and to all who have followed its development.

—ROGER C. WILLIAMS.

DROWNING TOPSOIL.—Recently the depth of silt in Lake Benton, Minn., was measured. Early records show that this prairie lake of 2,600 acres was from 15 to 24 feet deep. Now, silt from 5 to 15 feet deep has filled it until the lake is only 7 to 9 feet deep.

This silt, it is pointed out, was once topsoil. It was washed and blown into the lake from surrounding cropland. Future crop production thus is affected, and also the fish population.

By HERBERT I. JONES

William B. Aiken, Arthur Anderson, Alex Martin, Clyde Hutchins, and Oscar Land.

Tackling the Problem of Underground Seepage

Tom Kidd, technician, locates water-bearing stratum 10 feet down with this power machine.

WHEN I told Art Anderson, Fort Collins, Colo., Soil Conservation Service representative, that I "just couldn't see it!" Art replied: "That's the point, neither can anyone else. Consequently, we spend a lot of time and effort investigating every drainage job."

This was my introduction to the serious problem of underground seepage that yearly robs Colorado farmers of untold acres. Often it reaches the point where the accumulating salts grow thick and caustic on the surface. The site of alkali beds in the midst of productive farmland has become an all too familiar sight to all of us, but not so the reasons for them nor their cure.

Note.—The author is work unit conservationist, Soil Conservation Service, Littleton, Colo. This article is based on an article which originally appeared in *Western Farm Life*.

"You see," Art went on, "water moving underground through porous layers of the earth eventually comes to the surface or close to it. Evaporation leaves behind salts that finally become so concentrated they kill ordinary farm crops. The salts may even turn into forms that will completely change soil structure."

Art and Clem Dodson, soils expert attached to the Fort Collins Soil Conservation District,

Deep, accurate setting is the rule. Trenches here are 12 feet deep.

Careful setting of tile is necessary, due to flat grade.

further initiated me in this problem as we drove out to one of the spring jobs.

Southeast of Timnath, I met the three "young fellas" who I had been told were "doing something about it!" One was William Aiken, 91 years old, homesteader, salty as they come. His two partners on this job are Oscar Land, and Alex Martin, Jr.

I was immediately impressed by the confidence these men had in each other. And even more, perhaps, by the confidence they had in the Soil Conservation Service people, Art, Clem, and the engineer, Clyde Hutchins, right hand man of the planning and soils man.

While we looked over the work, and work it is, running thousands of feet of tile drain line at depths up to 14 feet, I questioned Oscar Land as to how he knew he wanted the job the way it was planned. He told me he didn't really know he wanted it that way, but he had confidence in the skill of the technicians, who had bored hundreds of holes to inventory the underground water. If they said the location was right—that was good enough for him. Confidence in the technical help was further brought out when I learned one of the contractors wanted to change design in some details, but Aiken, Oscar and Alex refused to consider any deviation from Hutchins' plans.

All this began in 1947 when Oscar Land tired of wasting between 30 and 40 acres to subsurface water. This acreage had never grown a crop in the 12 years he had farmed the Yancey Place. Oscar went to the Fort Collins Soil Conservation District office and explained the problem to Art Anderson. A preliminary investigation of the farm showed no possible way of disposing of the water even if it could be successfully intercepted. Oscar went ahead for several years with other conservation jobs that he and Art had planned but he always hung onto the thought of licking that underground water.

Later, in 1948 to be exact, Alex Martin started talking drainage. Art realized that if the Martin drain were set low enough and were big enough, it could carry the water from the Yancey land and from the Aiken land, in addition to picking up the subwater from Martin's own 75 wet and wasted acres. Everybody would benefit!

Plenty of gravel and coarse sand envelops all tile.

After it was pointed out how their common problem could be solved, the three neighbors who scarcely knew one another got together with the help of Art Anderson to beat the

(Continued on page 134)

Hail, Hawaii!

By ROBERT E. SWANSON
and WARREN S. IKEDA

Dr. Otto R. Younge, agronomist, University of Hawaii, used mike to tell about conservation practices at Poamoho Experiment Station.

Association officers: Jitsuo Teruya, secretary-treasurer; Alfred Alu, vice president from Maui; E. C. S. Crabbe, Jr., vice president from Kauai; Edward Hiroki, president; Desmond Fletcher, first vice president, Oahu; Norman McGuire, vice president from Molokai; Herbert Shipman, vice president from Hawaii Island.

Edward Hiroki, first president of the Hawaii association, flanked by Waters S. Davis, Jr., president of the National association, and Alan Thistle, executive officer of the Territorial Soil Conservation Committee.

FARMERS and ranchers in the Hawaiian Islands recently organized the Hawaii Association of Soil Conservation Districts—the 50th association of its kind under the American flag.

Time of launching was in September, during a 2-day field tour and conference sponsored by the 13 districts and the Territorial Soil Conservation Committee.

Forty-one directors of Hawaii's districts attended the field tour in rural Oahu, together with a hundred farmers and ranchers, representatives of pineapple and sugar plantations, equipment companies, and Federal and Territorial agencies.

Waters S. Davis, Jr., president of the National Association of Soil Conservation Dis-

Note.—The authors are, respectively, soil conservationist and soil scientist, Soil Conservation Service, Oahu and Wahiawa, T. H.

Dr. Younge explains effectiveness of conservation practices in use.

Directors of Hawaii's 13 soil conservation districts get together for a group picture during tour.

tricts, had a share in the event. His visit to the Islands came at the request of Edward Hiroki, chairman of the South Oahu Soil Conservation District. Hiroki was elected president of the new association.

The first day of the conference was devoted to an inspection of this beautiful tropical island, with particular attention to pineapple fields, truck farms, the University of Hawaii Experiment Station, Waialua High School, and the Kualoa Ranch. Cooperators with the West Oahu and Koolau Soil Conservation Districts were on hand to tell the story of their conversion to save-the-soil farming methods.

Here are some of the crops and practices that were seen during the day: Pineapple fields mulched with 40 to 60 tons of "trash" to the acre; half-mile-long waterways sodded with Pensacola Bahia grass; an alfalfa field from which 11 cuttings have been taken a year; a 500-acre planting of Guinea grass for pasture; a guava orchard mulched with cut Napier grass; and windbreaks of shrubby Hibiscus, the official flower of the Territory.

At the second day's conference, in Honolulu, the directors and their guests heard Samuel Wilder King, governor of Hawaii; Waters Davis, Jr.; Alan Thistle, executive officer of the Territorial Committee; and Tom F. McGourin, acting territorial conservationist, talk about the land problems of Hawaii and the Nation.

After the directors reviewed and adopted their articles of association and chose Edward

George Shimizu and Samuel Kamakau, knee-deep in sugarcane-trash mulch used to combat erosion and weeds in papaya orchard.

Hiroki as first association president, they elected five vice-presidents, each representing a major island: E. C. S. Crabbe, Jr., Kauai; Desmond Fletcher, Oahu; Norman McGuire, Molokai; Alfred Alu, Maui; and Herbert C. Shipman, Hawaii. Jitsuo Teruya of Oahu was appointed secretary-treasurer.

Thus, another step was taken toward permanent conservation in the colorful, tropical Hawaiian Islands.

UNDERGROUND SEEPAGE

(Continued from page 131)

underworld. A modern revival of the "log raising" of colonial times!

Land and Aiken are paying the extra cost of laying the Martin line deep and the extra cost of using big tile to carry all the water. The 1,600 feet of line being installed in 1954 is all on the Martin land. The group is organized by written agreement and has met frequently to consult the conservationists and to settle common problems. Meetings and plans are continuing as the group readies itself to install 7,500 feet of remaining drainage line during the winter of 1954-55. With the Martin work nearly completed, the Yancey-Land job can begin. Upon the completion of the job for Oscar Land, actual work on the 3,900 feet of line on the Aiken land can be started.

Several of the construction features are novel. Cemented gravel dikes were encountered at depths of 8 to 10 feet, and often another 2 or 3 feet of earth had yet to be removed. Dynamite was loaded in holes drilled in the rock and the trench filled back with loose dirt. After the dynamite was set off, shattering the rock ledge, the entire ditch was redug to the required depth.

We stood and watched huge draglines bite into the earth to the depth of 13 feet. As the tile pipe was deftly lowered it was laid close behind the digger with the joints snug but uncemented. The bed under the tile was made firm by tramping gravel into the soupy earth. Over the tile, and especially at the joints, an envelope of gravel was set to encourage the water to enter the pipe joints. The tile was graded with a fall of 1 inch in 5 feet, a variation of less than a quarter of an inch in 1 foot!

While all of this is costing the three farmers several thousand dollars, they expect to repay the cost in future years with crops off the land previously affected by salt and the high water table. The cost isn't over yet by a long way! Branch lines to hook on the main lines to benefit other parts of their farm may be planned in years to come. How effective is the work? Martin's shallow well in the feed lot went dry 2 months after work began!

Together these men farm 520 acres of land devoted mostly to sugar beets, alfalfa, corn and barley. These productive crops catch the eye of every visitor the minute they strike the fertile irrigated lands of Colorado. Most of the hay and grain is fed to cattle and sheep.

As the damaging subwater flows away and drains the surface soil, the three farmers will begin their program of soil reclamation by using plenty of manure and by plowing under as much stubble and other organic matter as possible. As this job progresses they may add some gypsum and sulphur soil amendments. Clover, sugar beets, and grain will stand fairly high amounts of alkali salts, so it is hoped that fair production can be obtained from even the worst damaged soils. All in all, immediate benefits of the job will be felt on 75 acres on each of the Aiken and Martin farms, and possibly as much as 100 acres on the Land-Yancey farm.

Oscar Land's parting remark was the thing I remember best: "So many of these underground drainage jobs are really unnecessary! If farmers would keep constant control of their water, would eliminate runoff, and wild flooding, and get together to line ditches and stop water waste, the water saved could do good to producing crops instead of injury to lower lands!"

LONG-LASTING GIFT.—The Barnwell (S. C.) Soil Conservation District recently presented $100 worth of conservation literature to the Barnwell County Library. The accompanying picture, taken by the McDonald Photo Service, shows district supervisiors Leon W. Lott and Algie M. Grubbs with librarian Mrs. Peter Stabovitch. They are looking at the new acquisition.

Drainage in the Big Horn Basin

Seepage creates special problems on many irrigated farms in the valleys of Wyoming.

Poor irrigation causes problems. These are cleared up by proper preparation of the land and control of irrigation water. The field at the left has been smoothed to a uniform, gentle slope. Laterals are correctly spaced so that the runs of water between them are not too long. At the right is a field that is uneven. About a quarter of this field is properly irrigated, about a quarter is under-irrigated because it is too high, and half of it is over-irrigated. The excess of water soaking into the ground helps raise the water table.

By C. KEITH MILLER

IN many irrigated areas of Wyoming and other states a considerable amount of land becomes seeped soon after irrigation water is applied. Ordinarily, seepage occurs on the lower portions of the farm and it usually increases yearly in size until, in some instances, an entire farm has been enveloped. In fact, seepage has become so critical in places that large portions of an irrigation project, including many entire farms, have been practically destroyed for purposes of cash-crop production.

A high water table is not always harmful to the land. But when there is also heavy evaporation, "salt" accumulations concentrate on or near the surface of the ground. Because of heavy salt concentration in the topsoil, much of the seeped land becomes toxic and only the most salt-tolerant plants will survive and grow. Eventually, entire fields become sterile and all we see are snow-white patches poking their faces out from amongst a few scattered salt-tolerant weeds.

Note.—The author is area conservationist, Soil Conservation Service, Worland, Wyo.

Usually, as the seeped acreage becomes more and more unproductive, the land operators attempt some kind of a drainage program. In the past many such drainage systems have proved unsatisfactory because of a lack of basic information about the soil and ground water conditions.

There is no single solution to all the drainage problems on irrigated land. Drainage practices and installations are just as complex as the establishment of good irrigation practices. They must meet the requirements of all of the various soil types, both surface and underground, which are present in areas considered for water application.

The Soil Conservation Service has found, in many soil conservation districts where it is working, that seepage is one of the serious problems standing in the way of improving conditions on irrigated lands. About 8 years ago the Service determined to do some special work in drainage in the Greybull Valley Soil Conservation District of Wyoming, as well as in a number of other soil conservation districts in the Big Horn River Valley.

There was a great deal of literature on drainage studies and on field investigations in non-irrigated sections of the country, but much of the information had little application to the semi-arid, irrigated valleys of Wyoming. Information on local conditions was necessary before a sound drainage program could be started. Field investigations, therefore, were undertaken on each farm or group of farms requesting technical assistance.

A geologist of the Service was assigned to drainage studies in the area, and it was his job to mobilize all pertinent information relating to soil, ground water, geology, and topography. During the first year of his assignment, investigations were made on a large number of farms in a number of soil conservation districts in the Big Horn River Valley.

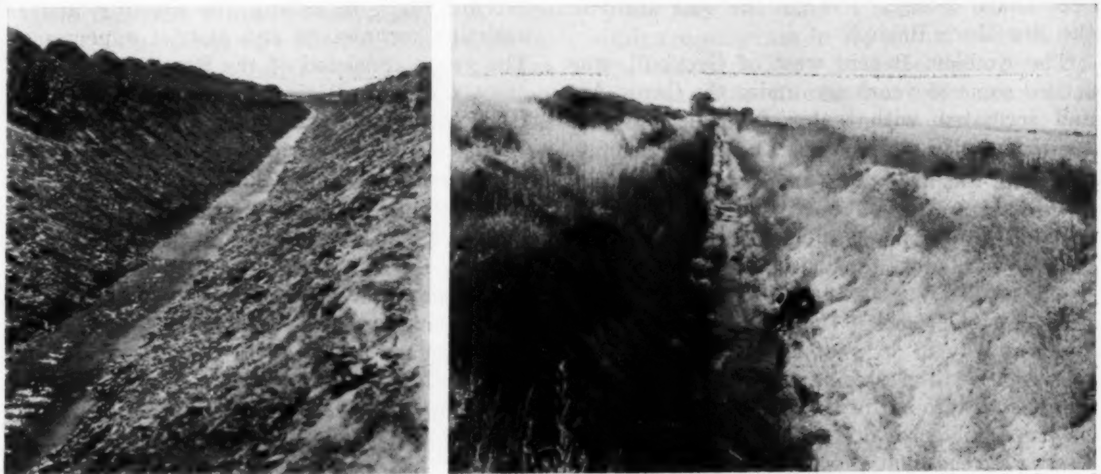
In the early stages of the investigations, hundreds of existing drains were examined in order to learn why most of them were failures and why a few were partially or completely successful. The next step was to examine seepage sources or causes, such as leaking canals, reservoirs, irrigation practices, natural seepage, and improper land use. Thousands of soil borings were made in and around problem areas in order to determine the soil and water relationship. The information obtained included the type and thickness of soil and subsoil layers, the permeability of soil and subsoil at various depths, the depth to water table or tables (if perched tables were encountered), and the depth to barriers, such as hardpan, clay or bedrock. All soil borings were drilled to depths of as much as 16 feet. Often, even such depths were insufficient for necessary information, in which event all the well logs in the immediate vicinity were checked and the data correlated. This data furnished cross-sectional information which was extremely valuable in later studies, especially in group drainage projects where entire valleys had to be taken into consideration.

After about a year of field investigations, it became evident that drainage under local conditions was a varied and complicated procedure. One farm unit might have as many as four different types of seepage, caused by poor irrigation practices or methods, leaking canals and ditches, a natural high water table condition, and poor water use by a neighboring farmer.

The first successful drainage in cooperation with the soil conservation districts was based on these drainage studies. The systems were oriented, in accordance with the findings of the investigations, and placed at the correct depth and in soils and subsoils that were permeable but still stable enough to prevent sloughing.

Field observations and examinations indicate that generally open ditches do not work properly in deep silty or sandy soils. That is because sloughing of the side slopes takes place during or soon after excavation. As a result, the sloughed materials not only block the grade of the drain, but also eliminate part of the original depth, creating slow velocities and


"Just across the road." The grainfield at the left has proper drainage. The drain is at the break of the slope in the background; it intercepts the flow of ground water. At the right are foxtail, watergrass and other vegetation that accompany a salt-bearing, high water table. The drain for the latter field runs parallel to the flow of ground water and therefore has little or no effect on the water table of this field.



Two views of drainage ditch 18 months apart. That at left was made soon after construction. Note the flow of water. The picture at the right shows the same ditch a year and a half later. There is still a strong flow. This is one of the drains on the Emblem bench.

standing pools of water. Tile drainage does not generally work efficiently in deep silty or sandy soils unless the tiles are protected or supported. For example, tile lines in deep sandy soils will bow and sag unless supported with wood, gravel packing or other means, and if straight tile (drainpipe) is used and joints are not partially wrapped, silt and sand will choke up the drain, rendering it useless.

Subsurface draining of the land is not always the best answer to the seep or alkali problem. If the land can be improved by simpler and cheaper methods, recommendations are made accordingly. For example, if the causes of seep are due to faulty or poor irrigation practices (too much water), long runs in the fields and leaking canals, elimination of the recharge sources may make drainage unnecessary. With the elimination of one or more of the recharge sources, the water table is often lowered to a point where adapted crops can be grown.

There are some lands that cannot be drained or where drainage is economically impractical. In these cases the only alternative left is careful water use and the elimination of possible recharge, with good control over waste water.

As mentioned previously, the basic information sought in drainage investigations is the relationship of soil, subsoil, ground water, geology, and topography. Once these facts are gathered and correlated, drainage can be determined as possible and practical, or possible but impractical. Many times, the conditions are such that even though the land can be drained, the cost of drainage systems exceeds the value of the land benefited. It is practically impossible to drain raw shaly soils underlain with shale bedrock. Heavy water applications on these soils are more damaging than beneficial. This is because of the great salt content, not only in the soils but also in the parent materials below.

Some of the most successful applications of this drainage procedure have been in the Greybull Valley Soil Conservation District. In this district, individuals and groups, in cooperation with the district, have installed approximately 36 miles of open drain systems averaging approximately 7 feet in depth and 19 miles of tile drains. These systems have improved over 9,800 acres of cropland.

Soil Conservation Service geologists working with the conservationists and engineers of the Service, located and oriented the systems. The conservationists and engineers carried out details of planning and staking, and supervised construction of the systems. Fields that were too wet to get equipment in before drainage was installed grew good barley crops the first year after drainage. Several farmers have

been heard to say, "I've got the best drain in the Big Horn Basin."

The Emblem Bench, west of Greybull, was settled some 35 years ago under the Carey Act and irrigated with water furnished by the Bench Canal Company.

Within this area there are 12 operating units with a total of 1,869 acres that were severely affected by seepage. The landowners concerned wanted to do something about their problem. They presented it to their board of district supervisors. It was determined that the best way to do what they felt was needed was for the interested landowners to organize themselves into an informal group to be known as the Emblem Enterprise Drainage Group. It was agreed that the landowners would pay all costs of construction if the Service would furnish the technical assistance on planning. An agreement covering all of these matters was drawn up between the Soil Conservation Service and the soil conservation district.

Technicians then applied themselves to this particular problem and determined to make it an example for an attack on similar drainage problems. First, a complete survey, including topography, ground water, and geological formations, was made. Second, the land use capabilities were determined. Third, cost estimates of the drainage systems were prepared. Suitable outlets were located and rights-of-way obtained from all persons, places, and agencies concerned. The original main drain ditch is 15,279 feet long, emptying into a natural channel into Dry Creek, a tributary of the Big Horn River.

The main ditch is about 30 feet wide at the top and from 7 to 8 feet deep, with slopes of 1½ to 1 for the particular local geological conditions of surface soil type and underlying gravel.

The drains were completed in 1947 and have worked so successfully that the water table has been lowered on far more than the originally estimated 1,869 acres, extending beyond the property lines of many of the farms.

One of the men located in the district, Christ Simon, a cooperator, took the leadership in getting his neighbors together so as to do something about the wet lands. He was the driving force in calling the meeting and in assisting technicians and district supervisors. The group consisted of the Bench Canal Company, the State Highway Department, the Big Horn County Commissioners, the Greybull Valley Soil Conservation District, the Soil Conservation Service, and the landowners.

The Simon farm was typical. In the summer of 1945, less than 12 of the 160 acres in it were dry. A root cellar in Simon's backyard had water up to within a couple of feet from the top. All of the land around his buildings and practically every acre of his farm was white with salt.

Simon applied for assistance from his soil conservation district shortly after he had bought the farm in 1945. That year, it was almost impossible for him to prepare a satisfactory seedbed. The water was coming into his land as a result of underground seepage through a gravel subsoil. In 1946, Simon's crops were almost a complete failure. Even with the high prices, he received less for his poor crops than it cost to operate. The drain was completed early in 1947, and his 1947 crop showed marked improvement. Simon's drainage system cost $18 per acre, which was his part of the cost of the main ditch and supplementary ditches installed on his land.

By 1948 Simon's land dried out sufficiently for him to plan his farm with the assistance of the Service farm planner, and start off with a complete set of rotations. At present his pasture soils are firm, all fields have lost their white luster, and he is cultivating and producing crops on every field of his farm. His beans average over 1,500 pounds per acre. The family has excellent strawberries and a fine garden.

In 1946 and 1947, the Simons were able to raise very little garden products. Today, the root cellar is dry and the shelves are loaded with canned foodstuffs. Their yard has lost its white color; it is dry and rapidly acquiring a good grass cover.

Simon planted a shelterbelt around his buildings in 1948, and the trees are doing very well. Recently, in discussing the improvement in the farm, he said: "The fruit trees which I recently planted are looking fine, whereas in

1946 they just couldn't make a go of it. One thing I like about this method of drainage installation is that when I paid the $18 an acre to have the job done, I was through—I don't have a lot of long-time payments with a lot of interest and assessments to look forward to."

Mrs. Simon commented on her excellent string beans, her cucumbers, and tomatoes, raised since 1948. Before that time her garden produced practically nothing.

This is about the same story told on each of the other 10 farms.

We may not have a solution to the entire drainage program in Wyoming, or in our Valley, but we do know that the Enterprise drain is an example of what has been accomplished on over 10,000 acres in the Big Horn Valley during the last couple of years. With further investigations, we are certain that we will find that many other apparently unsolved drainage problems can be whipped. Eventually, we hope to return many more thousands of acres of high-quality mountain valley irrigated land to high production.

Modern Planning Guides Martin and Sons

This leading farmer of Mississippi was a local pioneer in establishing improved pastures and in making maximum use of his timber resources. He and his sons have their large acreage under soil and water conservation, and invoke all the technical assistance available.

By R. C. FLANAGAN

"PLAN before you marry, plan before you plant." That's a good slogan on both counts, says Roy R. Martin, commissioner of the Rankin County (Miss.) Soil Conservation District.

Martin and three sons, Ralph, James, and Rupert, all of them veterans, began planning before marriage. Each son followed his father's example with a wedding on their sire's anniversary, December 27.

Today, Martin and his sons own 3,845 acres of land, which are under a complete soil and water conservation plan. Each son owns his own home and 400 acres of land. Ralph's operation is a separate one, while James, Rupert and the elder Martin have a joint enterprise.

Originally Roy Martin was a row crop farmer. He began in 1918 with 157 acres. Present cotton acreage is 70. There are 25 acres in corn, 110 acres in oats, and 85 acres in lespedeza. Improved varieties of oats are used with lespedeza in rotation with row crops.

Terraces with adequate waterways have been established on sloping cropland, while drainage facilities, including "V" and "W" ditches, have been installed on flat, wet areas. Contour farming, with the use of wild winter peas or vetch, is practiced each year.

In addition to building his cropland through rotation, Martin uses basic slag and legumes and anhydrous ammonia on corn, cotton, and oats. The 30 acres of lespedeza sericea on Class VI land are used entirely for supplementary grazing. A quarter of a mile of once-eroded roadside is now wrapped up with kudzu.

Martin also believes in the conservation of wildlife. Evidence of this fact is a lespedeza bicolor border which separates his cropland from a wooded area.

Livestock graze the lush pastures where plants are selected to suit the soil. The herds include 100 head of breeding beef cows, 100 head of steers, 100 feeder hogs, and 340 sheep. J. G. Payne, work unit conservationist, works closely

Note.—The author is area conservationist, Soil Conservation Service, Jackson. Miss.

with the Martins in developing a grazing program. Combinations of Pensacola bahia, bermudagrass, lespedeza, wild winter peas, and crimson clover are favored.

Wild winter peas go on the wet areas, while crimson clover is confined to the higher slopes. Dallis grass and white dutch clover are planted on the more level lands, whereas fescue and ladino are put on the flat wet areas classed as II and III lands.

Of the 500 acres of improved pasture, approximately 200 acres once were in woodland covered with blackjack. All fields are limed and fertilized in accordance with soil tests. The remaining acreage comes from idle land or has been from row crops.

Martin was one of the first farmers in the Rankin County Soil Conservation District to establish an improved pasture, starting with 10 acres in the fall of 1942. In the past 5 years, additional acres of improved pasture have gone in each year, totaling 500 acres at the present time. Most of the pastures have started with oats and ryegrass used as a nurse crop. Another essential in the land use pattern is water, which has been provided for by the construction of six well-spaced ponds and with the use of live streams fed by springs.

"In 1920 I sold enough timber from the original 157-acre tract to clear it of all indebtedness. That gave me an idea as to the value of timber in my farming operations," Martin says.

The first practice in the timber area was the construction of fire lanes, which served later as

The Martins plant more than 100 acres of oats for feed. This stand yielded more than 60 bushels per acre for James and Rupert Martin, seen here.

District Commissioner Roy Martin inspecting a field border of lespedeza bicolor which also provides food and cover for wildlife.

roads for logging operations. These fire lanes were laid out with the use of a soil survey map. They were located either on the ridge or on contour. A fire lane surrounds each 400 acres or less, where needed, depending on physical features. A total of 28 miles of fire lanes now has been constructed.

In 1949 Martin began "release and selective cutting." He was high in his praise of the assistance rendered him on these jobs by representatives of the Mississippi Forest Service, as well as other agricultural agencies.

A total of 736,000 board feet of pine timber and 320,000 board feet of hardwood has been cut on 1,300 acres since 1949. In addition to this, the tops of the pinetrees were cut into pulpwood and marketed on a truck or carload basis.

In the woodland improvement program, the work of nature was helped by the removal of 8,000 posts from overstocked areas. The posts were treated and used on the farm.

In many areas—approximately 185 acres—there were insufficient seed trees for natural reproduction of pine seedlings. Here Martin has planted a total of 185,000 seedlings, most of which were mechanically set.

Martin and his sons are practicing selective cutting on the entire 3,000 acres of woodland. They have made plans to divide their woodland area into 5 parts in order to establish a 5-year selective cutting cycle.

Roy Martin and his three sons, all college graduates, have proved that it pays to set up a conservation plan and then follow that plan, using all available technical assistance.

WOMAN OF THE YEAR.—The Golden Business and Professional Women's Club has chosen as its woman of the year for 1954 a modest and tireless educator, Mrs. Marguerite Juchem of Arvada, Colo. Since 1948, Mrs. Juchem has been a consultant in secondary education in the Colorado State Department, and has dedicated her life to the betterment of education.

Conservation education has been one of Mrs. Juchem's strong interests. She has worked with both educational and other agencies to promote the program in the schools of the state. She has been a member of the education committee of the Colorado Association of Soil Conservation Districts and has served on a committee of 11 persons who have been working on a coordinated conservation program for state agencies concerned with conservation.

In 1950, Mrs. Juchem was appointed by Governor Dan Thornton to the committee for the employment of the handicapped, and in 1953, to the State Board of Standards for Child Care. She is a member of the Colorado Council on High School and College Relations. During 1953-1954 she was a member of the Colorado Education Association's adult education committee, and in 1947 was chairman of the advisory committee on school health.

The safety of Colorado youth has been Mrs. Juchem's constant concern. She was general chairman of a group which produced *Highways to Health and Safety,* and has compiled a set of rules and regulations for school bus operation. In 1950, Governor Thornton appointed her deputy state director of Civil Defense Education, and in 1951, General Larsen, Civil Defense Director, sent her to Staff College at Olney, Md., to assist in setting up a civil defense program for the nation's schools.

Clifton L. Etter, SCS man, and M. C. McCormick appraise the sand lovegrass that provides grazing for Herefords

Out of Drought, A Lesson

Rains help, but so do sound conservation measures. This veteran of many dry years has faith in the future.

By VIRGIL S. BECK

YOU can't lick the dust bowl with wheat alone, says M. C. McCormick, who is carrying on a diversified enterprise on 3,700 acres 5 miles southeast of Holly, Colo. McCormick and his father came to Prowers County in 1920. He was here when the dust was blowing in the thirties. Out of his long experience in a dryland, he concludes that farmers ought not to try to cultivate marginal land if they wish to stop the blowing of the soil.

"A farmer cannot stay in business on only one good wheat crop every 4 or 5 years," he states. "The only solution I can see is to put the critical areas back to grass and grow feed crops instead of wheat on the cultivated land. If everyone would work toward such a solution, we eventually could lick this dust bowl problem. Of course, a few good rains would help."

On his 1,804-acre home place, McCormick has a small irrigation well, the first to be drilled in this area south of the Arkansas River. From it he irrigates 16 acres of alfalfa and 24 acres of feed crops.

A married son—M. C., Jr.—lives on a 320-acre tract purchased 4 years ago. This tract, too, was destined to have its thirst quenched.

Sought for the production of supplemental feed, water came in at 109 feet from a well that pumps 1,800 gallons a minute. The well irrigates 140 of the 320 acres, while 160 acres are dry farmed and 20 acres are in dryland grass.

McCormick has 250 Hereford cows and calves. He is in partnership with his two sons each of whom owns 25 Herefords.

Richard is a 17-year-old junior in the Holly High School. He belongs to a 4-H Club and the Future Farmers of America. Last year he showed the championship steer at the Prowers County Fair. In addition, he was named "Boy of the Week," and won numerous other awards. This year, he will enter both a Hereford and Aberdeen-Angus steer in the competition.

McCormick got a 98-percent calf crop this year, the best in a long while. Calves sell in the fall at around 400 pounds. He grows all of his feed except cottonseed cake, which is fed during the winter. He now plans to grow soybeans as a substitute for the cottonseed cake.

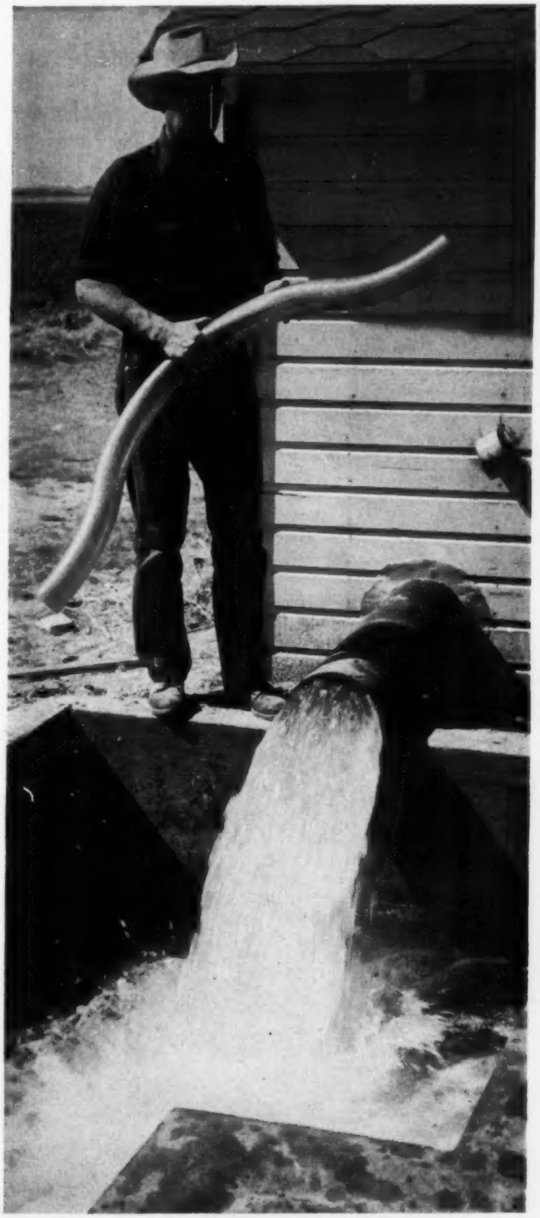
McCormick, who has been cooperating with the Northeast Prowers Soil Conservation District for the last 3 years, follows a program which provides for 320 acres in wheat, 320 acres in fallow for wheat, and 300 acres in grain sorghums for feed.

The last 4 years have been very dry, but McCormick finds his conservation of soil and water paying off. Last year was so dry that only fair crops were produced; however, he did get some 18 bushels of dryland wheat per acre. His irrigated feed crops were very good on the 140-acre tract, and he produced around 300 tons of silage which was stored in a trench silo, plus 500 tons of bundle feed. He still has around 50 to 60 tons of ensilage left.

In 1950 an old cultivated field of 30 acres, was blowing severly. McCormick decided to try to stabilize it by seeding sand lovegrass. An excellent stand resulted, and blowing has been eliminated completely.

"This old field now is furnishing such excellent grazing that my cattle have been breaking through the fence to reach it," McCormick reports. In addition to the grazing last year, the field was good for 500 pounds of clean seed. The seed is useful in planting other areas on his farm. Some overseeding of sparse stands of native sandhill range was done in 1951 and the results have been encouraging.

Soil blowing recently caused McCormick some trouble. There has been such damage even on some of the land on which he left high ungrazed sorghum stubble. Most of it traced back, however, to dirt caught from other unprotected



This well supplies 1,800 gallons per minute. It is one of the very few irrigation wells in this section south of the Arkansas River.

lands. McCormick checked the wind erosion by listing to turn up large clods.

"We now have a chance to lick the threat of the dust bowl if everyone will but follow the proper soil and water conservation practices," this farmer insists.

McCormick is always willing to try that which promises to improve his land and crops. His drilling of the first two irrigation wells in this section is a good example of his adventurous spirit, as is his intention to experiment with soybeans. We should note, too, that he now is growing 45 acres of sugar beets on the irrigated portion of his 320-acre tract.

Early spring rains brought good planting moisture to this part of Prowers County, and much of the blowing land is being seeded to grain sorghums which, if properly handled, will provide protection against wind erosion next year.

M. C. McCormick

Keith Matteson, who rebuilt a worn-out farm in 5 years.

ROAD TO PROSPERITY.—Five years ago Keith Matteson started to farm the conservation way. The change in practices cost him not more than $700 extra. But at the end of the 5 years this farmer took stock and found these results:

He could plow in April, use his equipment anywhere on his farm at any time, harvest his crops easier and at less expense.

He was selling hay instead of buying it.

He was getting 20 percent higher yields.

He had increased his production of milk per cow.

He was having a carryover of hay and silage, even though feeding a larger herd.

Matteson farms 345 acres near West Laurens, N. Y. He took over the place in 1946. He had an old tractor, 40 cows, no young animals, and little money to work with. Now, in contrast, he has a 70-head herd, with 43 milkers; 3 silos full of grass and corn, mows packed with top grade hay plus a surplus to meet any need. He is in a position to carry a herd of 100 head.

To get these benefits, Matteson, with assistance from the Otsego County Soil Conservation District, built 3,600 feet of diversions and cleared or renovated 19 acres of wasteland to make excellent pasture. He is preparing to clear still more land for grass and other crops.

We endanger or destroy the soil at our peril; any sound policy of land use must be synonymous with soil conservation and be in conformity with basic principles of soil use.

—From *Unasylva*, published by Food and Agriculture Organization